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Short Communication

EFFECT OF BAGGING MATERIALS AND BAG COLOUR ON FRUIT WEIGHT AND QUALITY OF GUAVA (*PISIDUM GUAJAVA* L.)

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INTRODUCTION

Guava (*Psidium guajava* L.) is an important and nutritious fruit crop in Sri Lanka. The fruit has a high market demand but severe fruit fly infestation badly reduce the marketable yield resulting in significant economic losses to growers. Farmers generally use heavy sprays of pesticides to limit the pest attack which results in higher levels of chemical residues in fruits endangering food and environmental safety. Bagging, a physical protection technique, not only protects fruit from pests and diseases but also influence the quality of the produce by changing micro environment of fruit during development (Son and Lee, 2008). Bagging of different fruits during development can reduce physical damages, improve colour at harvest (Muchui*et al.*, 2010; Amarante *et al.*, 2002) and yields high quality fruits (Kitagawa *et al.*, 1992). In Sri Lanka, only a few farmers use bags to protect the fruits. However, there is no information available on the most suitable bagging material and colour of the bags. Therefore, study was conducted to evaluate the effect of bagging material and colour of the bag on prevention of fruit fly damage and fruit size and quality of guava.

MATERIALS AND METHODS

The experiment was carried out at the Fruit Crops Research and Development Station, Peradeniya during January to December, 2014. Four year old guava trees of HORDI Selection 1 was used for the study. A Randomized Complete Block Design with 10 replicates was used for arrangement of the treatments. One tree was considered as a one replicate and for each treatment 10

fruits were used. Five colours of polythene bags, red, green, blue, yellow and white with transparent polythene, news paper bags, tea bags and nylon (white) bags were used for the study with a non-bagged control. Colour polythene bags (Tulip bags) were purchased and other bags were made using the above materials.

All bags were 25 cm x 20 cm in size and three holes of about 2 cm diameter was made under side of the bags. Fruits were bagged 10 days after fruit setting. Trees were managed by using recommended cultural practices by the Department of Agriculture. Fruits were harvested at 90 days after bagging and data were taken on pest and disease damages, fruit size, colour and quality characters. Fruit external and internal colour was recorded using RHS colour charts. Fruit hardiness was recorded using fruit pressure tester (Model FT-327). Fruit was chopped and juice was extracted to measure total soluble solids (TSS) by refractometer (Model MT032-ATC ENTEST, USA). Titration method with sodium hydroxide was used to calculate the acidity of the fruits. Data were statistically analyzed by use of MSTAT statistical software.

RESULTS AND DISCUSSION

Results of the study showed that all the fruits were free from fruit fly damage in bagged treatments. Hundred percent fruits of all these treatments were in marketable quality. However, above 80% of non-bagged fruits were damaged by fruit fly. Few fruits of non-bagged treatment have shown scab disease. Smooth appearance was observed in most of the fruits in bagged treatments. Fruit weight, fruit circumference and fruit hardiness of different treatments are given in Table 1. It indicated that all parameters were significantly different among treatments. Covering with blue and white polythene bags showed significantly higher fruit weight compared to non-bagged control and other bagging treatments. Higher fruit circumference was recorded from guava bagged with blue and white colour polythene.

Green, yellow, and nylon bags also gave significantly higher fruit circumference compared to control treatment. The lowest fruit circumference was recorded with the treatment which bagged using tea bags. Ping *et al.* (2003)

reported the effectiveness of bagging to accelerate growth of fruits and increase fruit size and weight of guava. Shiesh and Yang (2006) revealed that bagging increase temperature inside and promoted fruit development, resulting larger sized fruit. Wanichkul and Subrungroeng (1985) reported that bagged carmbola fruits showed significant difference in fruit weight when compared with non-bagged and the highest fruit weight was found in white polyethylene bags. Changes of weight and circumferences by covering of different colour polythene may be due to interaction between different light intensity and temperature inside the bag (Kutinyu, 2014).

Table 1- Effect of bagging materials on fruit weight, circumference and fruit hardiness of guava at maturity.

Treatment	Average fruit weight (g)	Average fruit circumference (cm)	Fruit hardiness (kg/cm^2)
Yellow polythene bags	228.4 ^{bcd}	25.1 ^{bc}	14.2^{de}
Red polythene bags	238.5 ^{bc}	24.9 ^{bcd}	15.6^{bc}
Blue polythene bags	302.3 ^{a}	27.4 ^{a}	14.2^{de}
Green polythene bags	252.6 ^{b}	22.6 ^{b}	13.9^{e}
White polythene bags	298.1 ^{a}	27.3 ^{a}	14.5^{de}
Transparent polythene bags	199.5 ^{d}	23.8 ^{e}	15.8^{b}
News paper bags	202.5 ^{d}	24.0 ^{cde}	154^{bcd}
Tea bags	198.3 ^{d}	23.3 e	12.6^{f}
Nylon bags	239.8 ^{b}	25.3 ^{bc}	14.9^{bcde}
Non bagged control	215.6 ^{d}	23.8^{de}	19.1^{a}
CV %	11.4	4.1	5.9

Note: CV=Coefficient of variation; Mean in each column followed by the same letters are not significantly different (p = 0.05).

High variation of fruit hardiness was observed among different bagging materials. The Lowest and the highest hardiness were recorded from guava bagged with tea bags and control treatment, respectively, and these were statistically different from all other treatments. Green, yellow and blue bags also gave significantly lower fruit hardiness compared to the control. Ping *et al.*,

(2003) reported that bagging made fruit coat smooth on Guava. In controversy, Sharma *et al.* (2013) recorded that bagged fruits had higher firmness than non-bagged fruits in apple. Results indicated that there was a high variation of fruit TSS of guava among different bagging materials. Higher TSS was recorded from guava bagged with blue and white colour polythene and it was significantly different from the control and other bagging treatments (Table 2).

Table 2: Effect of bagging material on chemical characters and external colour of guava fruits at maturity.

Treatment	TSS	Fruit Juice pH	Acidity level as a citric acid	External colour at maturity
Yellow polythene bags	12.5^{b}	4.64^{bc}	0.28 ^{abc}	Yellow-Green group 145A
Red polythene bags	12.^{6b}	4.62 ^{c}	0.31 ^{ab}	Yellow-Green group 144 C
Blue polythene bags	13.2^{a}	4.67 ^{bc}	0.32 ^{a}	Yellow-Green group 144 C
Green polythene bags	12.6^{b}	4.76 ^{bc}	0.24 ^{c}	Yellow-Green group 144 C
White polythene bags	13.6^{a}	4.74 ^{bc}	0.22 ^{c}	Yellow-Green group 144 C
Transparent polythene bags	11.5^{c}	4.89 ^{ab}	0.22 ^{c}	Yellow-Green group 144 C
News paper bags	11.0^{d}	5.06 ^{a}	0.25 ^{bc}	Yellow-Green group 145 A
Tea bags	12.0^{bc}	4.74 ^{bc}	0.32 ^{a}	Yellow-Green group 150 C
Nylon bags	12.0^{bc}	4.77 ^{bc}	0.26 ^{abc}	Yellow-Green group 144 C
Non bagged control	9.9^{e}	4.70 ^{bc}	0.23 ^{c}	Yellow-Green group 144 C
CV %	4.0	2.1	10.4	

Note: CV=Coefficient of variation; Mean in each column followed by the same letters are not significantly different (p = 0.05).

Yellow, red, green, tea bags and nylon bags also gave significantly higher TSS compared to control. Abbasi *et al.* (2014) reported that bagging of guava fruits by polythene increased TSS. Song (2002) also reported that guava bagging with blue polyethylene resulted in the highest TSS. Ping *et al.* (2003) reported transparent bag and red bag had no effects on TSS and bagging with black bag decreased the TSS in guava. Significantly different pH level of fruits was observed in different bagging treatments. The highest pH was observed in news paper bags and the lowest value was observed in red polythene bags. The results of previous studies also indicated that high pH level when bagging with news paper bags (Abbasi *et al.*, 2014).

Fruit external colour was different among different treatments (Table 2). Light green colour was recorded in yellow colour polythene bags and light greenish yellow colour was recorded in tea bags. Green colour was recorded by red, blue, green colour polythene bags and paper bags, polythene bags, nylon bags and control. Ping *et al.*, (2003) reported that bagging treatment made fruit coat smooth and fruit colour improved in guava. Amarante *et al.* (2010) reported bagged *Pyrus communis* fruit had a greener and lighter skin colour than non-bagged fruit. Wanichkul and Subrungroeng (1985) reported that carmbola fruits showed appropriate colour of peel, pulp and segment ridges after bagging with white polythene.

CONCLUSIONS

Results clearly indicated the effectiveness of bagging on fruit fly control of Guava. Colour and materials of bagging have significant effect on size and quality of the fruits. White and blue polythene bags are the most suitable types to increase the weight and quality of the fruits while protecting from fruit fly attacks.

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